blacks and one gives 100 per cent. belts! These results are in accord with the experience of breeders, and explain this experience completely.

How shall the breeder proceed to eliminate the undesirable blacks? If a single dominant unit character were to be bred pure, the way to do this would be to discard both parents when black pigs occur. This would rapidly reduce the number of black pigs produced. But here we desire to perpetuate two dominant characters. The desired result will ultimately be secured by discarding both parents of all black pigs farrowed, but very slowly; for heterozygotes are not always revealed by breeding them together. For instance, types *b* and *c* bred together produce only belted pigs. Neither can we test out the heterozygotes by breeding to blacks, for in many cases this type of breeding gives only belts. We can, however, determine whether an individual is homozygous by breeding to a breed which possesses neither of the factors *F* and *G*. Only type *a* thus bred will give all belts. But here a difficulty arises. One or the other of these factors is present in at least four other breeds. This is demonstrated by the fact that when Tamworths are crossed on Chester whites, and when Duroc-Jerseys are crossed on Yorkshires, the belt sometimes appears in part or all the progeny. It is not yet known whether Berkshires and Poland Chinas possess either of these factors.

The presence of the factors *F* and *G* in four of our standard breeds accounts fully for the occasional occurrence of 'listed' (belted) hogs in swine of mixed breding, a not uncommon occurrence in sections where mixed breeding is common.

The fact that some breeds possess the factor *F* and others the factor *G*, unsuspected until revealed by the numerous breed crosses made by Mr. Q. I. Simpson, hints at the possibility that at some remote time the ancestors of our domesticated swine were belted after the manner of the related Indian tapir, and that the belt disappeared by the gradual weakening of factor *F* in some cases and of factor *G* in others. In America, where our swine trace to breeds from all parts of the world, these factors have been brought together again, renewing this striking belt character. It is suggested that the Tamworths and Yorkshires probably carry the same factor, these breeds both coming from England. Chester whites and Duroc-Jerseys originated in America, and possibly inherited the other factor from the Chinese hog, which entered into most of our early breeds.

It is entirely possible that the belt character is more complex than here indicated. However, the difference between belted and black Hampshires evidently relates to two factors only.

The distribution of black and white in Berkshires and Poland Chinas is evidently governed in a manner similar to that above assumed for Hampshires, though it is not known how many factors are concerned. These two breeds are black with white 'points.' Until recently Poland Chinas were black and white spotted. The presence of a few animals in the breed having the black color with white points furnished the factor or factors that ultimately gave the breed its present color type.

It is suggested that the arrangement of color on all spotted animals may be governed in some such manner as that here indicated. The presence of several factors having this relation to color distribution, and scattered promiscuously through a spotted breed, would account for observed facts. The tendency for color spots to appear in definite places, as black on the rump in swine having most of the body white, a very persistent tendency, the localization of spots on fox terriers, and the strong tendency for red hairs to appear about the ears of white cattle, all point in this direction.

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WING VEINS OF INSECTS

AN adequate reply correcting all the misstatements occurring in the review[1] in SCIENCE of February 8, of my article on wing veins would be beyond the limits of space available for this article, and I shall have to

[1] Pp. 219–229.

be content with the general disclaimer, that it is in the main a criticism of views on venation originating with the reviewer and not held by myself.

Probably a combination of the effects of views strongly opposed to those of the author and a very cursory reading of the work reviewed have brought about the confusion resulting in thus attributing to the author much that he has never believed and in giving to the whole presentation a distortion that makes the theory almost unrecognizable.

Had he read more carefully he would not have failed to have seen, for instance, that the three series under which heads winged insects were discussed, were not presented as natural groups (p. 219), nor that the argument favoring the essential identity of tracheated and non-tracheated veins is the conclusion of the argument against the tracheal origin of veins (p. 220), nor have given what I considered as a possible though unwarranted view as being the basis of the system of independents (p. 221), nor the small table at the end of the chapter on Lepidoptera as the objective point of the whole work (p. 222), nor a score of other equally evident blunders.

I desire, however, at this time to criticize the argument offered by the reviewer: "The very presence of tracheæ," he writes, "between the two membranes of the wing when they are fusing sufficiently accounts for the primary location of the veins" (p. 220). The membranes fuse only after the emergence of the insect and the expansion of the wing. The cuticular differentiation of vein and membrane either in the wing of an existing insect or in the organ from which the wing was produced in the ancestor of winged insects, is dependent upon changes in the epithelial cells before the deposition of chitin preceding the final molt, and not at the time of the fusing of the membranes. This is simply the way differences of external structure of any part of the body are brought about, not during the molting process, but usually before or possibly rarely during the process of the cuticle deposition which precedes the molt.

Possibly it may be supposed that he inadvertently used the word 'membranes' but intended to mean the epithelial lining of the wing pad or of the organ which was the precursor of the wing, since in former articles he has described these cell layers as fusing. They usually simply touch, however, and often come into no definite organic union. The vein cavities also are so much larger than the tracheæ that it is very hard to see how their presence could have been any determining factor. It is not as though the tracheæ mechanically held the epithelial layers apart. Furthermore, why should a longitudinal vein require the presence of a trachea to warn off the approaching epithelial cells, but the cross-veins from the beginning remain capable of looking out for themselves?

These later suggestions, however, do not represent that author's present point of view, for he is evidently laboring under the delusion that the wing, unlike any other part of the insect's body, expands at the molting time devoid of cuticle and the cells perform this function only after expanding, for he speaks of the 'differentiation of veins from membrane, by the accumulation of cells about the vein cavities, and the stretching out of those that lie between' (p. 221). Now as long as the wing remains in the wing pad the veins occupy a very disproportionately large space and the cells of the membrane are correspondingly crowded—and in no conceivable sense can they be spoken of as stretching except under the assumption that the wings first expand before these cells are exhausted in cuticle production.

This absolute failure to appreciate the facts in the ontogeny of the wing, which must also have been true in whatsoever organ the wing may be supposed to originate, this fundamental misconception is accountable, I believe, for that author clinging so strenuously to the really unsupportable theory of the tracheal origin of veins.

C. W. Woodworth
University of California,
Berkeley, March 1, 1907

DELAYING THE BLOSSOMING OF PEACH TREES BY ETHERIZATION

As a means of avoiding late spring frosts, the writer finds that the season of blossoming